## AREA OF FOCUS #1

# Diabetes Mellitus, Type 2

Diabetes mellitus is a group of diseases characterized by high levels of blood glucose resulting from defects in insulin secretion, insulin action, or both.

Type 1 diabetes accounts for approximately 5 to 10 percent of all cases of diabetes in the United States, and type 2 diabetes for 90 to 95 percent. Gestational diabetes, a transient elevation of blood glucose during pregnancy, occurs in approximately 3 to 5 percent of pregnancies. About 1 to 2 percent of the diabetes syndrome is comprised of other types of diabetes, that have a variety of causes, such as genetic defects in insulin action, diseases of the pancreas, or drug-induced diabetes.

Diabetes affects approximately 16 million people in the United States, with one-third of these being unaware that they have the disease. Minority populations do not appear to have a higher prevalence of type 1 diabetes. However, they are more frequently affected by type 2 diabetes. Minority groups comprise 25 percent of all adult patients with diabetes in the United States and represent the majority of children and adolescents with type 2 diabetes.

- African Americans, Hispanic/Latino Americans, American Indians, and some Asian Americans and Native Hawaiians and other Pacific Islanders are at particularly high risk for development of type 2 diabetes. Diabetes prevalence rates among American Indians are two to five times those of Whites. On the average, African-American adults are 1.7 times as likely and Mexican-Americans and Puerto Ricans are twice as likely to have the disease as non-Hispanic whites of similar age. Cuban-Americans do not seem to have an elevated risk of diabetes. Some Asian American and Native Hawaiian and other Pacific Islander groups, such as Japanese Americans and Samoans, also have elevated rates of diabetes.
- All patients with diabetes are at high risk for microvascular complications affecting the eyes, nerves, and kidneys; for lower extremity amputations; and for coronary heart disease. Diabetes patients from racial and ethnic minorities, however, are more likely to develop the microvascular complications of diabetes and to have lower extremity amputations, compared with non-Hispanic white patients with diabetes.
- The rates of coronary heart disease in minority populations may not be greater than in non-Hispanic whites with diabetes; however, the frequency of cardiovascular complications in all patients with diabetes is two to five times that of people who do not have diabetes.
- Much of the racial and ethnic disparity in diabetes microvascular complications may be due to higher levels of risk factors for these conditions in minority patients with diabetes, such as hyperglycemia and hypertension. However, there also seems to be a genetic component that influences the development of certain of the microvascular complications of diabetes. In addition, there may be other physiologic, metabolic, behavioral, and health care differences that account for part of the disparity in the frequency of diabetes complications.

- Diabetes in pregnancy is associated with increased risk of congenital malformations and complications during delivery and in the perinatal period.
- Due to the intrauterine environment, offspring of diabetic pregnancies have greatly increased risks of obesity and type 2 diabetes during childhood and adolescence. Women from minority groups, especially American Indian women, are much more likely to have type 2 diabetes during their child-bearing years.
- In American Indian populations, maternal diabetes during pregnancy increases the risk of type 2 diabetes in childhood 10-fold and is the most important risk factor for development of type 2 diabetes in childhood.
- The mechanisms of how maternal diabetes increases the risk of diabetes and obesity in children and knowledge of how to modify these risks are largely unknown.
- Type 2 diabetes, once considered a disease of adults only, has been increasing in children and adolescents. Childhood diabetes clinics have reported that as many as one-third of their new onsetdiabetes patients have type 2 diabetes. More than three-quarters of these children are minorities.
- Rates of type 2 diabetes in adolescent Pima Indians have doubled in the past 30 years. Thirty years ago, type 2 diabetes was not found in Pima children in the age group 5 to 9 years old. Now more than 1 percent of children this age have type 2 diabetes.
- ◆ Type 2 diabetes in childhood and adolescence leads to the development of serious kidney, eye, and heart disease in young adulthood in many of these children. Currently, there are no approved medications for treatment of childhood obesity or type 2 diabetes in childhood. Low calorie diets, behavior modification, and exercise are the mainstays of treatment, but have had limited success in the past.

## **Research Goal 1**

To prevent or delay the development of diabetes in minority populations (African Americans, American Indians/Alaska Natives, Hispanic/Latino Americans, Asian Americans, and Native Hawaiians and other Pacific Islanders)

## **Current Activities**

NIDDK funds an extensive portfolio of basic, clinical, epidemiologic, and behavioral research on the etiology of diabetes. Advances in understanding the underlying causes of diabetes through such research are a critical first step in determining the factors that account for the higher rates of diabetes observed in racial/ethnic minority populations. The Institute has recently published a program announcement (PA) soliciting research to expand our understanding of the metabolic, genetic, epidemiologic, socio-cultural, and behavioral mechanisms that contribute to the racial and ethnic differences in the etiology of type 2 diabetes in the United States.

Determining the underlying genetic factors in diabetes is also an important step in understanding the higher rates of diabetes in minority populations. To enhance this area, NIDDK has established a consortium of investigators studying different populations who are cooperating to find the genes that cause diabetes.

Type 2 diabetes in children is an emerging health problem that appears to disproportionately affect minority populations. NIDDK has recently published a Request for Application (RFA) soliciting applications for a research program on type 2 diabetes in children.



NIDDK is conducting the Diabetes Prevention Program (DPP) clinical trial, a large multicenter study of diabetes prevention in 27 centers across the United States. Recruitment is complete, and 45 percent of the study participants are from racial/ethnic minority populations. This study is collecting important data that will advance our understanding of the factors that lead to the development and prevention of diabetes. Similarly, NIDDK is conducting a prevention trial for type 1 diabetes (DPT-1). Although type 1 diabetes is not increased in racial/ethnic minority populations, it can be a devastating disease for patients. DPT-1 has been successful in screening minority populations and entering minority patients into the trial. This study may yield essential data on the factors leading to type 1 diabetes that may have important implications for all people at risk for the disease, including racial/ethnic minorities.

The NIDDK Diabetes Research and Training Centers (DRTCs) are conducting research in behavioral science as well as demonstration and education projects that are advancing our knowledge of the behavioral and psychosocial factors underlying diabetes onset and control in racial/ethnic minorities.

Because of the extremely high incidence and prevalence of type 2 diabetes mellitus and obesity in the Pima Indians of Arizona, NIDDK has conducted for many years an intramural program of research on diabetes and obesity in this American Indian population. In recent years, these clinical and epidemiological studies have been extended to include genetic studies. In addition, there are current plans for increased emphasis on intervention trials and studies of prevention and treatment of diabetes and its complications in this population. This Pima Indian population is currently participating in the DPP clinical trial and is expected to participate in the ongoing Look AHEAD (Action for Health and Diabetes) trial (formerly the Study of Health Outcomes of Weight Loss (SHOW)) trial (see the discussion on the Look AHEAD trial under Goal 2 of this focus area). Also listed below under diabetes initiatives are additional specific initiatives to be undertaken with the Pima Indians through the NIDDK Phoenix Epidemiology and Clinical Research Branch in Phoenix, Arizona.

Studies in the Pima Indian community are examining the underlying mechanisms that lead from maternal diabetes during pregnancy to obesity and type 2 diabetes in their offspring. These include examination of insulin resistance, insulin secretion, energy expenditure, physical activity, and eating behaviors in offspring of mothers who had diabetes during pregnancy.

## **Potential New Initiatives**

 Determine the underlying physiologic, metabolic, genetic, psychosocial, and behavioral factors that cause the racial and ethnic differences in the incidence of diabetes.

#### **Expected Outcome**

This initiative will promote and further expand NIDDK's program on the etiology of diabetes in minority populations and its program on type 2 diabetes in children. The program expansion will include extending for 2 additional years the recently issued PAs to solicit further research grant applications, giving special consideration to grant applications in this area that would otherwise not receive funding, fully funding grants in this program area, and stimulating investigators to focus their research in these areas. Attracting new researchers to this area, including those from minority populations, is critical to the future success of this plan. NIDDK will seek collaboration with the NIH National Center for Minority Health and Health Disparities to enhance these research areas. The initiative will also help expand the research program on the genetics of diabetes in minority populations. Genetic studies of susceptibility to type 2 diabetes and obesity in the Pima Indians will be continued and replicated in other populations.

## **Action Plan**

Mechanisms of funding will include Research Project Grants (R01s) and Cooperative Agreements (U01s).

2. Develop and test interventions to reduce the frequency and adverse impact of risk factors for development of diabetes in minority populations.

## **Expected Outcome**

The Diabetes Mellitus Interagency Coordinating Committee (DMICC) met May 11, 2000, with a committee of American Indian tribal leaders representing American Indian peoples to exchange ideas about the problem of type 2 diabetes in American Indian children. This meeting will foster cooperation between tribal Nations and investigators in the diabetes field, which will be important in devising effective, culturally sensitive approaches to prevention and management of diabetes. NIDDK plans to build on the program of research on the etiology of type 2 diabetes in children and to enhance collaboration with American Indian leaders on an initiative to develop interventions for the treatment and prevention of type 2 diabetes.

In November 1999, NIDDK hosted a conference focusing on behavioral research in diabetes with a focus on the effective application of behavioral science to reduce the burdens associated with diabetes. Working groups of experts in the fields of lifestyle modification, psychosocial therapies, health care delivery, communication of diabetes risk, behavior, and the roles of psychology and education in prevention made recommendations for research priorities. Research opportunities identified at the workshop are being promoted through a solicitation in collaboration with the NIH Office of Behavioral and Social Sciences Research (OBSSR). This solicitation will foster research related to prevention and treatment of diabetes. Special consideration will be given to research projects that focus on health disparities, such as approaches to developing and promoting efforts to enhance exercise, healthy eating, and early detection of diabetes in high-risk populations.

NIDDK will begin development of an action plan for translating the results of the DPP, in the event that the trial demonstrates that lifestyle modification and/or drug treatment prevents or delays the onset of type 2 diabetes. To carry this forward, discussions have begun with the Centers for Disease Control and Prevention (CDC) and the National Diabetes Education Program (NDEP). Educational programs need to be developed, tested, and ready for implementation in the event that the study results are positive. These programs will be

tailored to the special requirements of minority populations. Additional clinical trials of new pharmacological agents or different approaches to weight loss and physical activity in prevention of type 2 diabetes may be initiated in the Pima Indian population.

#### **Action Plan**

Multiple mechanisms of funding will be used to implement this initiative.

3. Conduct a study to examine the current delivery of care in diabetic pregnancies in the Pima Indian community and how prenatal factors (such as levels of glucose control in the mother, maternal insulin treatment, and availability of dietetic, medical, and nursing services) relate to pregnancy outcomes.

There is a need (1) to understand the relationship of metabolic abnormalities in the mother and how maternal diabetes leads to adverse outcomes for her children and (2) to determine if current management practices of diabetic pregnancy are effective in preventing adverse long-term consequences.

#### **Expected Outcome**

These initiatives will determine to what extent currently accepted practice is being delivered to women at risk, will identify those women who are having adverse outcomes, set new standards for clinical care based on health outcomes, and identify areas in which management might be improved. This information will in turn help reduce the burden of diabetes in childhood in American Indians and other minorities who have a high frequency of type 2 diabetes during the child-bearing years.

#### **Action Plan**

Funding will be sought to support a multicenter program examining the care of diabetic pregnancy in Pima Indian women through the NIDDK Phoenix Epidemiology and Clinical Research Branch in Phoenix, Arizona.

## **Research Goal 2**

To prevent or delay the development of the complications of diabetes in minority populations

## **Current Activities**

NIDDK has an extensive research portfolio of basic, clinical, epidemiologic, and behavioral research related to the etiology of the complications of diabetes. Research is also supported on identifying the underlying genetic factors that place some individuals at higher risk for complications. Understanding the etiology of complications is a critical step in determining why minority populations are at higher risk for complications and is the first step in developing tailored interventions for these specific populations.

In FY 1999, PAs and RFAs were published by NIDDK soliciting research on the factors leading to higher rates of complications in minority populations, the pathogenesis and treatment of complications of type 2 diabetes in children, the prevention and treatment of amputations in diabetic individuals with foot ulcers, the role of endothelial cell dysfunction in diabetic complications, and the role of growth factors in the development of diabetes complications.

NIDDK also supports an extensive research program in the pathogenesis of diabetic nephropathy (see Area of Focus #3: End-Stage Renal Disease). NIDDK, in collaboration with other NIH Institutes, also published PAs and RFAs in FY 1999, soliciting research applications on the neurobiology of diabetic complications, cellular and molecular mechanisms of diabetic cardiomyopathy, enhancing adherence to diabetes self-management behaviors, and developing and testing interventions to improve adherence to pharmacological treatment regimens.

NIDDK is supporting clinical trials in the prevention of diabetes complications. The Diabetes Prevention Program, discussed in Goal 1, is investigating whether the onset of type 2 diabetes can be prevented or delayed. Delaying diabetes onset will reduce the lifetime exposure to high blood glucose levels due to diabetes and has the potential to reduce diabetes complications. This study, if positive, will have important implications for the prevention of diabetes complications in minority populations, who comprise 45 percent of the study participants.

The Look AHEAD effort (formerly SHOW) is a multicenter, randomized clinical trial to study whether interventions designed to produce sustained weight loss in obese individuals with type 2 diabetes mellitus improve health and prevent complications. Through the Department of Veterans Affairs, NIDDK is supporting a clinical trial of limb salvage in patients with diabetes who have advanced neuropathy. NIDDK is cosponsoring, with the National Heart Lung and Blood Institute (NHLBI), the ACCORD study that is assessing whether the rate of major cardiovascular disease events can be reduced by intensive control of blood glucose, blood pressure, and blood lipids. NIDDK is collaborating with the Centers for Disease Control and Prevention on TRIAD (Translating Research Into Action for Diabetes), a study to examine the effectiveness and cost-benefit of improved quality of diabetes care on quality of life and health status for people with diabetes in managed care settings.

## **Potential New Initiatives**

 Investigate differences among contemporary populations in the United States, characterized by race/ethnicity and other factors, in the prevalence of risk factors for complications of diabetes and in rates of these complications.

#### **Expected Outcome**

NIDDK recognizes a need to obtain data on the frequency and extent of health disparities in contemporary populations. By collaborating with the National Center for Health Statistics (NCHS) in implementing diabetes components into their national surveys, information will be obtained on the status of health care, glucose control, and complications in the U.S. population.

#### **Action Plan**

Mechanism of funding will be by Research Project Grants (R01s).

2. Investigate the extent to which variations in glycemic control and other aspects of health care, metabolic and genetic factors, socioeconomic status, and behavioral and other factors contribute to the higher risk for development and progression of complications in minority patients with diabetes.

#### **Expected Outcome**

This initiative, if successful, will expand research on the factors leading to higher rates of complications in minority populations.

#### **Action Plan**

This initiative will be accomplished by extending for 2 additional years the PAs recently issued to solicit further research grant applications, giving special consideration to research grants in this area, and fully funding these applications where appropriate. Collaboration with the NIH National Center for Minority Health and Health Disparities will be sought to enhance these research areas.

 Develop and test appropriate and efficacious treatment and management strategies for diabetes and its complications that are tailored to the needs of minority populations.

#### **Expected Outcome**

Research will be targeted to develop effective interventions for patients at risk for diabetes and with established diabetes with the goal of reducing complications. Development and translation of effective interventions targeted at high-risk populations prior to onset of diabetes will reduce the risk of developing diabetes and thus prevent complications. Another initiative will lead to expansion of the research program on prevention of amputations in patients with diabetes.

Depression is three to four times more prevalent in patients with diabetes than in the general population and may have a devastating impact on management of diabetes and increase risk for developing the complications of diabetes. Little is known about the biologic, psychosocial, and developmental processes contributing to depression in diabetes in minority populations. A taskforce meeting on depression in diabetes, a factor that may contribute to increased diabetes complications and risk for onset of diabetes, was held in 2000, with the National Institute of Mental Health (NIMH). The results of this meeting will lead to a solicitation to increase research efforts in this important area.

#### **Action Plan**

Provide additional funding for grants in this area. Special consideration will be given to applications in this area, and successful applications will be fully funded where appropriate.

## **Public Information and Outreach Goal**

To expand diabetes education and outreach to populations disproportionately affected by diabetes, that is, African Americans, Hispanic/Latino Americans, American Indians/Alaska Natives, Asian Americans, and Native Hawaiians and other Pacific Islanders

## **Current Activities**

The National Diabetes Education Program (NDEP) is a joint partnership of NIDDK, the Centers for Disease Control and Prevention, and over 150 public and private sector partners. The program's purpose is to improve treatment and outcomes for people with diabetes, to promote early diagnosis, and, ultimately, to prevent the onset of diabetes.

The participation of representatives of African American, Hispanic/Latino American, American Indian/Alaskan Native, Asian American, and Native Hawaiian and other Pacific Islander communities is a key feature of the NDEP Partnership. With NIDDK support, the Special Populations Workgroup designed and implemented campaigns through the mass media in communities throughout the United States. The campaign, "Control Your Diabetes For Life," was officially launched at a news conference in June 1998. Over the following year, the TV public service announcement (PSA), "The Many Faces of Diabetes," received millions of dollars of free airtime.

The NDEP African American Workgroup introduced a media campaign at the Congressional Black Caucus annual meeting in September 1998. Concepts center around the idea of family influence and a family reunion theme with a "control your diabetes for life" message. The entire campaign was released in summer 1999. The radio announcement, "Give It Up," challenges families to support people with diabetes in their efforts to eat fewer high fat foods. Through July 1999, the radio PSA aired 36,090 times on 597 stations in 395 cities in 49 states. An accompanying print advertisement reached more than 2.5 million people.

The TV PSA, "Family Reunion," aired over 8,000 times in the 7-month period June 1999 to January 2000.

"Rayos y Truenos" (Thunder and Lightening) was first developed by the NDEP Hispanic and Latino Workgroup and launched in June 1998. The 1998 campaign featured the comfort of home and family during a stormy night. The new 1999 television, radio, and print campaign materials feature a rainstorm and a car stuck in snow to bring home the message "There are many things in life that can't be controlled. Fortunately, diabetes isn't one of them." Through November 1998, the TV PSA reached more than 6.6 million people, the radio advertisement more than 8 million, and the printed advertisement more than 6 million.

The American Indian campaign is developed and distributed by the NDEP American Indian Workgroup. Featuring television, print, and recorded radio PSAs, the campaign, "Future Generations," emphasizes controlling diabetes as an example for the children who carry on the traditions of the culture.

The Asian American and Native Hawaiian and other Pacific Islanders Workgroup chose to focus on a campaign featuring a series of print PSAs and a live radio script. The diversity of cultures and languages in this population group is illustrated by the need of the workgroup to translate materials into eight different languages.

More than four million Medicare beneficiaries suffer from diabetes. Under the NDEP and in collaboration with the Health Care Financing Administration, an initial public awareness campaign aimed at older African Americans was implemented when Medicare benefits were expanded to cover the costs of diabetes equipment and supplies. In April 1999, the campaign began promoting TV, radio, and print PSAs in English and Spanish and a community development kit.

The National Diabetes Information Clearinghouse (NDIC) is an NIDDK program designed to disseminate information about diabetes and its complications to health professionals, patients, and the public. NDIC works with NDEP to design and distribute informational materials to minority audiences, especially African American and Hispanic audiences. NDIC developed a Spanish-language series of booklets on recommended practices for people with type 2 diabetes.

## **Potential New Initiatives**

 Develop additional media strategies (1) to increase awareness of the seriousness of type 2 diabetes and an understanding of diabetes and its control and (2) to promote a unified approach to diabetes care among minority populations with diabetes, health care providers, audiences at risk or undiagnosed, payers, health care purchasers, and policy makers.

## **Action Plan**

Expand the reach of the current NDEP "Control Your Diabetes For Life" media campaign to minority audiences with culturally appropriate messages about diabetes and its control. Develop additional strategies and tools with NDEP partners representing special populations to promote NDEP messages and develop additional evaluation mechanisms to assess effectiveness of the campaign and partner relationships.

2. Develop community interventions for African Americans, Hispanic/Latino Americans, American Indians and Alaska Natives, Asian Americans, and Native Hawaiians and other Pacific Islanders through trusted and valued community channels and organizations that promote healthy lifestyle behaviors for diabetes care.

#### **Action Plan**

Develop community intervention programs that are culturally and linguistically appropriate for minority audiences, provide technical assistance to tailor and implement programs for minority audiences, and develop evaluation mechanisms to assess effectiveness of programs.

 Promote health care policies that improve quality and access to diabetes care for minority audiences.

#### **Action Plan**

Produce resources and training materials for health care providers that address cultural sensitivity issues for people with diabetes and their families and produce educational materials and programs that support quality care for African Americans, Hispanic/Latino Americans, American Indians and Alaska Natives, Asian Americans, and Native Hawaiians and other Pacific Islanders with diabetes.

4. Communicate health messages to members of the Pima Indian community in Phoenix, Arizona.

#### **Current Activities**

For many years, NIDDK has conducted research with the Gila River and Salt River Indian communities near Phoenix, Arizona. Tribal members suffer from a high incidence of type 2 diabetes and end-stage renal disease (ESRD). NIDDK distributes a culturally relevant booklet, which describes the Pima tribe's culture, history, and health concerns.

#### **Action Plan**

At the request of the Tribal Council, work with Council members to produce a culturally appropriate video about organ donation for people with ESRD at their local clinic. Develop continuing communications strategy to coordinate activities with NDEP.